

REMARKS

This amendment is responsive to the Office Action that was mailed December 15, 2004 (hereinafter "Office Action").

Amendments to the Specification

The specification has been amended to remove the space on page 2, line 27. The cooling step of module 150 shown in FIG. 1 is now referred to in the specification as step F' so as to distinguish the process step from feed stream F. References to the effluent and product gas on page 9, lines 13-18, have been amended to refer to effluent P and product gas P, respectively. In addition, the inconsistencies in capitalization on pages 10, 12 and 13 have also been remedied. None of these amendments are believed to introduce new matter.

Corrections To The Drawings

Applicant has corrected FIG. 1 by replacing the letter F with F' in reference to the cooling process step that is intermediate process steps E and G. A replacement sheet for FIG. 1 is enclosed herewith.

Applicant has corrected FIG. 2 by inserting a generalized symbol for a heat exchanger into module 150 and labeling the symbol with reference number 152 as is described in the specification. Support for this correction is found in the specification on page 10, lines 26-28. A replacement sheet for FIG. 2 is enclosed herewith.

Applicant has corrected FIG. 3A by changing reference numbers 400, 410, 420, 430, 440, 450, 480 and 490 to 300, 310, 320, 330, 340, 350, 380 and 390, respectively. Support for these corrections are found in the specification beginning on page 11, line 14 and bridging to page 12, line 15. In addition, Applicant has corrected FIG. 3A, by changing reference "MF" shown in the original drawing adjacent to outlet 490 to reference "ME" and has reversed the direction of the arrow that is adjacent outlet 490. Support for these additional corrections to FIG. 3A can be found in the specification on page 12, lines 4-7. A replacement sheet for FIG. 3A is enclosed herewith.

Applicant has also corrected FIG. 3B by changing reference numbers 400, 410, 420, 430, 440, 450, 460, 470, 480 and 490 to 300, 310, 320, 330, 340, 350,

360, 370, 380 and 390, respectively. Support for these corrections are found in the specification beginning on 11, line 14 and bridging to page 12, line 15. In addition, Applicant has corrected FIG. 3B, by reversing the direction of the arrow that is shown in the original drawing adjacent to outlet 490. Support for this correction can be found in the specification on page 12, lines 4-7. A replacement sheet for FIG. 3B is enclosed herewith.

Amendments To The Claims

Claims 1-5 have been cancelled without prejudice. New claims 12-16 have been added.

New claim 12 is directed to a module for use in a compact fuel processor comprising among other elements a fixed bed reactor having a desulfurization material. New claim 13 depends from claim 12 and further recites that the desulfurization material comprises zinc oxide. Support for new claims 12-13 is found throughout the specification and drawings and in particular on page 6, lines 15-28, page 12, lines 16-30, and on page 13, lines 1-19. New claims 12 and 13 do not introduce new matter.

New claim 14 is directed to a module for use in a compact fuel processor comprising among other elements a fixed bed reactor having a water gas shift catalyst. New claim 15 depends from claim 14 and further recites that the water gas shift catalyst comprises a high temperature shift catalyst and/or a low temperature shift catalyst. Support for new claims 14 and 15 is found throughout the specification and drawings and in particular beginning on page 7, line 7, bridging to page 8, line 6, on page 12, lines 16-30, and on page 13, lines 1-19. New claims 14 and 15 do not introduce new matter.

New claim 16 is directed to module for use in a compact fuel processor comprising among other elements a fixed bed reactor having a preferential oxidation catalyst for converting carbon monoxide to carbon dioxide. Support for new claim 16 is found throughout the specification and drawings and in particular beginning on page 8, line 18, bridging to page 9, line 12, on page 12, lines 16-30, and on page 13, lines 1-19. New claim 16 does not introduce new matter.

Claim Rejections Under 35 U.S.C. §103(a)

As set forth in the Office Action, claims 6-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,326,537 ("Cleary") in view of U.S. Patent No. 4,438,691 ("McShea"). Applicant respectfully disagrees with this conclusion for the reasons that follow.

Cleary is directed to a portable catalytic oxidizer for use in the destruction or complete oxidation of hydrocarbon vapors. The oxidizer has an outer shell and a catalyst chamber in combination with a spiral-type heat exchanger. See col. 2, lines 41-48. The reference indicates throughout that the catalyst is to provide complete oxidation of a hydrocarbon stream to carbon dioxide and water. See col. 5, lines 23-27. However, the reference is unclear as to the composition of such an oxidation catalyst. Specifically, while it is disclosed that prior art catalytic combustors usually comprise platinum group metals deposited on high surface area alumina substrates, there is no description concerning the composition of the oxidation catalyst that is to be used in the Cleary apparatus. See col. 1, lines 17-24. Moreover, and as was recognized by the Office, Cleary fails to teach that such prior art combustion catalysts can be used as an autothermal catalyst as is recited in Applicant's claims 6-11. Applicant would also add that Cleary fails to teach the use of a desulfurization material, a water gas shift catalyst or a preferential oxidation catalyst as are recited in Applicant's new claims 12-16.

With regard to the McShea reference, McShea discloses a process for the manufacture of a synthetic natural gas using a combination of coal gasification and autothermal reforming. Following gasification and quenching of the gasification products, liquid hydrocarbons and phenols are recovered and combined for routing to an autothermal reactor. Oxidant and steam are pre-heated separately from the liquid hydrocarbon/phenol mixture, which are then combined and fed to the autothermal reactor. There is no teaching or suggestion in McShea that the pre-heating of the reforming reactants should occur in a spiral-type heat exchanger or that the described autothermal reactor should comprise a spiral-type heat exchanger. Moreover, although the type and form of catalyst used in the autothermal reactor of McShea are described in significant detail, there is no teaching or suggestion that the reactor should comprise an

oxidation catalyst that will provide for the complete oxidation of hydrocarbons to carbon dioxide and water.

Based on the disclosures of Cleary and McShea, the Office has concluded that,

the use of the reactor and catalyst of Cleary for autothermal reforming would be obvious to one of ordinary skill in the art, because it would amount to nothing more than a use of a known catalyst and reactor for its intended use in a known environment to accomplish entirely expected result.

See page 6 of the Office Action. However, the expressed intended use and expected result of the Cleary reactor/catalyst is the complete oxidation of hydrocarbon vapor to carbon dioxide and water. There is no teaching or suggestion in Cleary that the catalyst to be used in the apparatus should be anything other than a catalyst that will ensure complete oxidation. Although McShea discloses an autothermal reforming reaction using a partial oxidation catalyst and steam reforming catalyst the reference contains no teaching or suggestion that would have motivated one skilled in the art to have included such catalyst(s) in a complete oxidation device such as is disclosed in Cleary.

Applicant respectfully disagrees with the conclusion of the Office for the reason that it has not been shown that the reactor and catalyst of Cleary were known to be capable of reforming a hydrocarbon to a hydrogen rich gas or would have been expected to be capable of reforming a hydrocarbon to a hydrogen rich gas. Absent such a teaching, one of ordinary skill in the art would not have been motivated to combine the teachings of Cleary and McShea as suggested by the Office. Claims 6-11 are not unpatentable under 35 U.S.C. §103(a) over Cleary in view of McShea.

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All of the stated grounds of objection and rejection are believed to have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn. Applicant believes that a

U.S.S.N. 10/006,880
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March 15, 2005

full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Frank C. Turner", is written over a horizontal line.

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March 15, 2005
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